



KAPITEL 2 / CHAPTER 2²

AN OVERVIEW OF EXISTING AIR QUALITY MODELS FOR CLIMATE CHANGE IMPACT ON HUMAN HEALTH

DOI: 10.30890/2709-2313.2023-21-01-014

Introduction

and overview of external environment

The impact of climate change on natural systems and people is spread across the globe. The existing consequences of climate change, regardless of their causes and influences of factors, can affect people's lives. Many phenomena in the field of nature are characterized by a relationship with human activities: for example, an increase in temperature or a change in precipitation regime are directly related to the activities of research scientists. The negative consequences of inaction will not only be for the economy and the environment, but will equally affect the entire population with its daily activities in all areas. Already today the problem of climate change is serious and global for mankind. Despite the fact that the threat does not yet apply to future generations of people (and maybe even they will never face it at all before), including all peoples, the poorest and most vulnerable will have to pay a high price. As far as the normal life of the population will be disrupted, a drop in the standard of living will inevitably lead to the extinction of people or their complete destruction. If no measures are taken, it is possible to expect an increase in the average global temperature of the earth's surface during our century by more than 3 ° C and in some places even higher. The melting of the ice is likely to continue or even accelerate due to the expected increase in ocean temperatures. Sea levels are predicted to rise by an average of 24-30 cm by 2065 and 40-63 years later. Although climate change may not happen again tomorrow due to the cessation of greenhouse gas emissions. Yes, it is clear that measures to build climate resilience will be paramount for the foreseeable future. At the same time, in a time of rapid urbanization, UN-Habitat is committed to advancing effective measures to prevent the negative impacts of climate change on cities and recognizes that without successful adaptation to them, it is impossible to achieve sustainable resilience of these settlements. Cities may be the most polluted, but they are also the center of innovation and the economy of growth. Actions to combat climate change make cities the catalysts for these actions. It is worth recognizing the complexity of the world and the need to work together to counter the effects of climate

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change in cooperation with a wide range of organizations. UNHabitat is working to mobilize employees from various fields of activity: personnel are collected from professionals in their field; experience is gained by implementing effective measures to support sustainable urban development. The underlying methodology of urban resilience (CRRI) is climate change mitigation. It was developed by UN-Habitat and uses a strategy of least resistance with a strong focus on combating climate change to gain insight. THE PURPOSE OF THE GERD is to identify which resilience trends are vulnerabilities and which urban interconnections are more likely to have synergistic factors. It is these definitions that will become the backbone of priority measures to improve the system of urban life. The climate module tries to find the most relevant elements of the CRIT methodology to help the world in the face of climate change. Its goal is to create a "snapshot" of the world after the impact of weather changes on climate. Climate change is the leading theme of our time. She is not only seen on a significant political scene in world politics, but is also the object of close attention of the mainstream media of public opinion and the country's civic identity. Today, the world's population is about 54 percent of the total number of living people. And by 2050, the urban population is expected to grow by 2.5 - 3 billion people. Accordingly, cities will be the main battlefield and the fight against the effects of climate change will either be won or lost. Urban measures to combat climate change are very complex due to the large share of greenhouse gases emitted by cities, the complexity of the management system (very often the functions and responsibilities of different levels of government overlap), and the scale of the phenomenon. Despite this, the opportunities to provide a real counteraction to climate change are quite impressive by optimizing the size and compactness of the population. This has a positive effect not only in terms of saving resources, but also in terms of increasing the efficiency of data use. Therefore, it is not surprising that the global development strategies covering the developments below point to a particular focus on the interrelationships between climate-smart measures and sustainable urban development. A noticeable increase in problem areas in the life of the world awaits us in the coming decades. The Intergovernmental Panel on Climate Change predicts that urban land will increase by 1.2 million square kilometers between 2000 and 2030 or about one and a half percent. This prediction refers to the loss of green infrastructure, which plays a key role in human adaptation to climate change. Also, a high exposure of the population to risks is more typical for areas of informal development and is the leading characteristic of this forecast. Due to the high degree of shortage in infrastructure and public services, the risk of climate



change is increasing. The 2015 Paris Agreement recognizes that climate change is a real and unprecedented challenge for the entire planet; In order to reduce global temperature rise by the end of the century (as envisaged by the agreement), it is necessary to achieve climate neutrality in the current regime in order to further regulate it throughout this century. These agreements spell out ambitious goals to limit the growth of global thermal mass. Fundamental for countering the effects of climate change, together with mitigation measures and adaptation acts, are the concepts and trends contained in the Agreement. Funding from a common source can be an important factor in achieving the goal. It is also worth paying attention to how the potential is being built from the side of technologies through which progress is being made. Most of the countries were required to submit their reports describing the problems that have arisen due to climate change and how they can be addressed through "nationally determined contributions". Some of these states have already found or are developing new comprehensive solutions to these issues. Climate measures aimed at the development of the world. New sustainable development goals to achieve long-term sustainability, it is necessary to use a harmonious approach that includes all three components: environmental; economic and social. Without these key components, progress and achievements will not be sustainable in the medium term. Targets aimed at transforming our world were developed in 2015 by the Sustainable Development Goals (SDGs). Climate change has already affected the security of life, food and water in countries, the very existence of the people where it is needed. This task works on the idea of developing with climate change in mind, so it is necessary to reduce greenhouse gas emissions and create climate resilience. In addition, it is necessary to develop the ability to adapt to dangerous conditions by developing the ability to adapt to extreme weather forecasts or natural disasters. Also, the importance of improving the quality of education and outreach in all areas is indicated: mitigation of the effects of climate change; adaptation to them; impact reduction. early warning. Mitigation measures are directly related to reducing greenhouse gas emissions. At the same time, resources must be used efficiently in order to reduce these costs. SDG12 intends to achieve sustainable management and efficient use of natural resources, as well as significantly increase the number of communities implementing comprehensive policies regarding the social integration of climate change outcomes. Condition 12: Transition to sustainable patterns of consumption and production. Climate change is a new target for SDG 13. Urgent measures must be taken to combat climate change and its consequences. The New Urban Agenda (2016)⁷ considers the impact of climate



change on cities to be key, and recognizes the role of cities in countering the impacts of change. The sustainability and viability outside the world is directly affected by the approach to planning, financing the development of the construction sector. This vision is a model world for all, protected from external influences and filled with opportunities. It is also an example of a socially integrated urban economy. When modeling consumption, it is necessary to use the efficient use of resources, thus reducing the negative impact on the environment. For example, by producing goods with high quality and using minimal energy costs, it is necessary to protect ecosystems from destruction while conserving water resources to maintain biological diversity. This section of the framework document suggests that it is necessary to adopt and implement risk management mechanisms to reduce vulnerabilities, create the ability to quickly respond to man-made disasters, and stimulate climate change adaptation measures to mitigate their consequences. Article 80 - We commit to take steps to combat climate change at the international, national and local levels, including adaptation to and mitigation of climate change. And to support the efforts of cities, settlements by their inhabitants, as well as all interested persons as subjects playing an important role in the implementation of such actions. I consider how climate adaptation measures will impact the world. Based on evidence, it is necessary to analyze the impacts of climate change. This approach is at the heart of the Urban Resilience Assessment Tool and is inherent in the analysis of climate change. The viability analysis of the CRGI can be said to be comprehensive, covering the world system in its measurements of vulnerability and hazard likelihood while not forgetting to take into account regulatory/governance issues. CIOCG is a holistic approach to addressing climate change response, incorporating the hazards of the weather-related world into a cross-sectoral analysis of all aspects of human society. This requires an understanding of the challenges that climate change poses to the world's ecology and economy. Based on this, plans should be drawn up to reduce the risks of adapting to changes, as well as carrying out work aimed at ensuring resilience. The evidence and trends emerging in climate change are not always easy to understand for world dwellers or government agencies due to lack of resources. The level of world resilience is a subject that is readily available to local governments and citizens. The assessment tool can help them overcome these difficulties. Based on data collection, stakeholders (climate change specialists, information service providers and residents) are involved in the formation of a framework for increasing the resilience of the world in the course of diagnosing the world's exposure to various risks, its degree of sensitivity to them + the ability of



the metropolis to adapt. Summarizing the problems that are caused by climate change in general. Analyzing the ICHG, one can identify the main problems of the world and how they affect its inhabitants: from constant heat to rainfall; droughts or floods with rapid results (after a few months); thermal stresses when exposed to high air temperature during the filling of roads with sand, as well as to avoid flooding of residential buildings. Checking the information with the help of the local community, identifying problems and finding out what has already been done in relation to this situation provide an opportunity to know the plans for the upcoming period.

Factors influencing climate change in cities Analyzing exposure to weather changes and its impact on environmental factors, together with sensitivity assessments, are critical to understanding the impact of urban systems on changing living conditions. When planning activities aimed at increasing climate resilience, it is essential to assess the ability of a world to adapt not only through its physical components (infrastructure), but also through its social/science/technological/intellectual components.

Results of the research, discussion and analysis of result

Climate change mitigation refers to the proactive measures taken to limit the impact of climate change by reducing greenhouse gas emissions or removing them from the atmosphere³. The primary contributor to the recent increase in global average temperature is the release of emissions from the burning of fossil fuels such as coal, oil, and natural gas. Mitigation efforts involve transitioning to sustainable energy sources, conserving energy, and improving efficiency to decrease emissions. Additionally, carbon sequestration techniques, including expanding forests, restoring wetlands, and implementing other natural and technological processes, can help remove carbon dioxide (CO₂) from the atmosphere. These actions are collectively known as carbon sequestration⁴. Governments and companies have committed to reducing emissions in accordance with international agreements aimed at limiting global warming⁵.

Solar energy and wind power offer significant potential for mitigation at a

³ IPCC, 2021: [Annex VII: Glossary](#) [Matthews, J.B.R., V. Möller, R. van Diemen, J.S. Fuglestvedt, V. Masson-Delmotte, C. Méndez, S. Semenov, A. Reisinger (eds.)].

⁴ Olivier J.G.J. and Peters J.A.H.W. (2020), [Trends in global CO₂ and total greenhouse gas emissions: 2020 report](#). PBL Netherlands Environmental Assessment Agency, The Hague.

⁵ Sector by sector: where do global greenhouse gas emissions come from?". Our World in Data. Retrieved 16 November 2022.



relatively low cost compared to other alternatives⁶. Although the availability of sunshine and wind varies, this challenge can be addressed through energy storage and advancements in electrical grids. Long-distance electricity transmission, demand management, and the diversification of renewable energy sources are effective strategies in this regard⁷. Electrifying infrastructure, such as vehicles and heating appliances, can reduce emissions from systems that rely on fossil fuels. Shifting to renewable energy sources for electricity generation further minimizes emissions. Adopting energy-efficient technologies like heat pumps and electric vehicles also contributes to improved energy efficiency. For industrial processes that inevitably produce carbon dioxide, implementing carbon capture and storage methods can help mitigate net emissions⁸.

In addition to carbon dioxide, agriculture also contributes to greenhouse gas emissions through the release of methane and nitrous oxide. Emission reduction in agriculture can be achieved by minimizing food waste, transitioning towards more plant-based diets, protecting ecosystems, and improving farming practices.

Emission reduction can be accomplished through changes in energy sources, industrial processes, farming techniques, and consumer behavior, including diet choices and urban development and transportation methods.

Climate change mitigation policies encompass various approaches, such as carbon pricing through carbon taxes and emissions trading, facilitating renewable energy deployment by relaxing regulations, reducing subsidies for fossil fuels, divesting from fossil fuel industries, and providing subsidies for clean energy alternatives. However, current policies are projected to result in a global warming of approximately 2.7 °C by 2100, surpassing the target set by the 2015 Paris Agreement of limiting global warming to well below 2 °C and preferably to 1.5 °C. Nonetheless, limiting warming to 2 °C globally may yield greater economic benefits compared to the associated costs⁹.

There are three primary approaches to reducing demand for products and services that contribute to greenhouse gas emissions. The first approach involves promoting

⁶ IPCC (2022) Summary for policy makers in Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, United States

⁷ Ram M., Bogdanov D., Aghahosseini A., Gulagi A., Oyewo A.S., Child M., Caldera U., Sadovskaia K., Farfan J., Barbosa LSNS., Fasihi M., Khalili S., Dalheimer B., Gruber G., Traber T., De Caluwe F., Fell H.-J., Breyer C. Global Energy System based on 100% Renewable Energy – Power, Heat, Transport and Desalination Sectors. Study by Lappeenranta University of Technology and Energy Watch Group, Lappeenranta, Berlin, March 2019.

⁸ "Cement – Analysis". *IEA*. Retrieved 24 November 2022.

⁹ IPCC (2022). Shukla, P.R.; Skea, J.; Slade, R.; Al Khourdajie, A.; et al. (eds.). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. p. 300



behavioral and cultural changes to decrease demand. For example, altering dietary choices can have a significant impact. The second approach entails improving infrastructure to reduce demand. A well-developed public transportation system serves as an example. Lastly, changes in end-use technology can effectively lower energy demand. For instance, a well-insulated house emits fewer emissions than a poorly-insulated one.

Mitigation options that target demand reduction empower individuals to make personal choices in reducing their carbon footprint. This can encompass decisions related to transportation and food consumption. Such demand-side mitigation actions have significant social implications. They can contribute to the development of low-carbon lifestyle role models if individuals with higher socio-economic status actively reduce their emissions and advocate for environmentally friendly policies. However, consumer behavior is influenced by various psychological factors, including awareness and perceived risk. Government policies play a crucial role in supporting or hindering demand-side mitigation options. For instance, public policies can promote the concept of a circular economy, which aligns with climate change mitigation efforts. Additionally, reducing greenhouse gas emissions is linked to the principles of the sharing economy.

There is an ongoing debate regarding the relationship between economic growth and emissions. It appears that economic growth no longer necessarily translates into higher emissions¹⁰.

In 2018, global primary energy demand surpassed 161,000 terawatt hours (TWh) encompassing electricity, transportation, and heating, including all associated losses. Fossil fuel utilization in transportation and electricity production exhibits low efficiency, typically below 50%, resulting in significant waste of heat in power plants and vehicle motors. Consequently, the actual energy consumed amounts to a much lower figure of 116,000 TWh¹¹.

Energy conservation refers to the deliberate efforts made to reduce energy consumption by utilizing fewer energy services. This can be achieved through increased energy efficiency, where less energy is used to produce the same level of service. Additionally, reducing the amount of service used can contribute to energy conservation, such as driving less frequently. Energy conservation holds a prominent

¹⁰ 2021-2022 EIB Climate Survey, part 3 of 3: The economic and social impact of the green transition". EIB.org. Retrieved 4 April 2022.

¹¹ Key World Energy Statistics 2020 (Report). IEA. 2020.



position in the sustainable energy hierarchy¹². Strategies to conserve energy involve minimizing wastage and losses while enhancing efficiency through technology upgrades and improved operational and maintenance practices.

Efficient energy use, often referred to as energy efficiency, entails reducing the energy requirements for providing products and services. Notably, improved energy efficiency in buildings (commonly known as "green buildings"), industrial processes, and transportation could potentially reduce global energy needs by one third by 2050. This would significantly contribute to the reduction of global greenhouse gas emissions¹³. For instance, implementing insulation measures in buildings enables them to utilize less energy for heating and cooling while maintaining thermal comfort. Enhancements in energy efficiency are generally achieved through the adoption of more efficient technologies or production processes¹⁴. Additionally, employing well-established methods to minimize energy losses is another effective approach.

Taking individual action on climate change encompasses various personal choices that can have a significant impact. These choices span different areas such as diet, travel, household energy usage, consumption patterns, and family planning. Individuals aiming to reduce their carbon footprint can opt for high-impact actions, including minimizing air travel and reliance on petrol-fueled vehicles, adopting a primarily plant-based diet, considering family size and having fewer children¹⁵, prolonging the use of clothing and electrical products, and transitioning to electric-powered homes¹⁶. These approaches are more accessible and practical for individuals residing in high-income countries with high-consumption lifestyles. However, individuals with lower income status may face greater challenges in implementing these changes, as options like electric cars might not be readily available to them. It's worth noting that excessive consumption has a larger role in driving climate change compared to population growth. High-consumption lifestyles significantly contribute to environmental impact, with the top 10% wealthiest individuals responsible for approximately half of total lifestyle emissions¹⁷.

¹² "A guide for effective energy saving". Renewable Energy World. 9 April 2015. Archived from the original on 11 June 2016. Retrieved 14 June 2016.

¹³ "The value of urgent action on energy efficiency – Analysis". IEA. Retrieved 23 November 2022.

¹⁴ Diesendorf, Mark (2007). *Greenhouse Solutions with Sustainable Energy*, UNSW Press, p. 86.

¹⁵ Wolf, C.; Ripple, W.J.; Crist, E. (2021). "Human population, social justice, and climate policy". *Sustainability Science*. **16** (5): 1753–1756. doi:10.1007/s11625-021-00951-w. S2CID 233404010

¹⁶ Adcock, Bronwyn (2022). "Electric Monaros and hotted-up skateboards : the 'genius' who wants to electrify our world". the Guardian. Retrieved 6 February 2022.

¹⁷ Westlake, Steve (11 April 2019). "Climate change: yes, your individual action does make a difference". The Conversation. Archived from the original on 18 December 2019. Retrieved 9 December 2019.



Some scientists argue that eliminating meat and dairy products from one's diet is considered the most impactful way for individuals to reduce their environmental footprint. Embracing a vegetarian diet on a large scale could potentially reduce food-related greenhouse gas emissions by 63% by 2050. In 2016, China implemented new dietary guidelines aimed at reducing meat consumption by 50%, thereby cutting greenhouse gas emissions by 1 gigaton per year by 2030. Globally, the food sector accounts for the largest portion of consumption-based greenhouse gas emissions, contributing to nearly 20% of the global carbon footprint. Approximately 15% of all human-caused greenhouse gas emissions are attributed to the livestock industry.

Shifting towards plant-based diets would have a positive impact on mitigating climate change. Specifically, reducing meat consumption would help decrease methane emissions, and if high-income nations transitioned to plant-based diets, significant amounts of land currently used for animal agriculture could be restored to its natural state. This restoration potential could lead to the sequestration of 100 billion tons of CO₂ by the end of the century¹⁸.

Population growth has contributed to increased greenhouse gas emissions, particularly in regions such as Africa. However, the impact of economic growth outweighs that of population growth. As incomes rise and consumption patterns change, along with population growth, there is increased pressure on land and other natural resources. This, in turn, leads to higher greenhouse gas emissions and a reduction in carbon sinks. Some scholars argue that implementing humane policies to slow population growth should be part of a comprehensive climate response, along with policies that promote the phasing out of fossil fuels and encourage sustainable consumption. Advancements in female education and reproductive health, particularly the availability of voluntary family planning, can play a significant role in reducing population growth¹⁹.

The IPCC Sixth Assessment Report emphasizes the importance of "preserving and enhancing carbon sinks" as a significant mitigation measure. This refers to managing Earth's natural carbon sinks in a way that maintains or increases their capacity to remove CO₂ from the atmosphere and store it effectively. This process is

¹⁸ Sun, Zhongxiao; Scherer, Laura; Tukker, Arnold; Spawn-Lee, Seth A.; Bruckner, Martin; Gibbs, Holly K.; Behrens, Paul (January 2022). "Dietary change in high-income nations alone can lead to substantial double climate dividend"

¹⁹ Patrick Devine-Wright, Julio Diaz-José, Frank Geels, Arnulf Grubler, Nadia Maïzi, Eric Masanet, Yacob Mulugetta, Chioma Daisy Onyige-Ebeniro, Patricia E. Perkins, Alessandro Sanches Pereira, Elke Ursula Weber (2022) Chapter 5: Demand, services and social aspects of mitigation in Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, United States



known as carbon sequestration. According to the IPCC, a sink is defined as any process, activity, or mechanism that removes a greenhouse gas or its precursor from the atmosphere. The two primary carbon sinks on a global scale are vegetation and the ocean²⁰.

To enhance the carbon sequestration capabilities of ecosystems, changes are required in agriculture and forestry practices. Examples include preventing deforestation and restoring natural ecosystems through reforestation efforts. Scenarios that aim to limit global warming to 1.5 °C often involve the widespread implementation of carbon dioxide removal methods throughout the 21st century²¹. However, there are concerns about relying too heavily on these technologies and their potential environmental impacts. Nevertheless, ecosystem restoration and reduced land conversion are among the most effective mitigation strategies, yielding substantial emissions reductions before 2030.

In the context of mitigation, land-based options are referred to as "AFOLU mitigation options" in the 2022 IPCC report. AFOLU stands for "agriculture, forestry, and other land use." The report highlights the economic mitigation potential of activities related to forests and ecosystems, such as the conservation, improved management, and restoration of forests, as well as coastal wetlands, peatlands, savannas, and grasslands. Notably, a significant mitigation potential exists in reducing deforestation in tropical regions, with an estimated economic potential of 4.2 to 7.4 gigatons of carbon dioxide equivalent (GtCO₂-eq) per year.

In 2007, the Stern Review on the economics of climate change highlighted that reducing deforestation was a highly cost-effective method of mitigating greenhouse gas emissions. The majority of deforestation, approximately 95%, occurs in tropical regions, where land clearance for agricultural purposes is a major driver. One strategy for forest conservation involves transferring land rights from public ownership to indigenous communities. However, it is common for land concessions to be granted to powerful extractive companies instead. Conservation approaches that exclude or displace local populations, known as fortress conservation, often result in increased exploitation of the land as indigenous communities seek employment with extractive

²⁰ "Carbon Sources and Sinks". National Geographic Society. 2020-03-26. Archived from the original on 14 December 2020. Retrieved 2021-06-18.

²¹ Bui, Mai; Adjiman, Claire S.; Bardow, André; Anthony, Edward J.; Boston, Andy; Brown, Solomon; Fennell, Paul S.; Fuss, Sabine; Galindo, Amparo; Hackett, Leigh A.; Hallett, Jason P.; Herzog, Howard J.; Jackson, George; Kemper, Jasmin; Krevor, Samuel (2018). "Carbon capture and storage (CCS): the way forward". *Energy & Environmental Science*



industries for their livelihoods.

Pro-forestation focuses on maximizing the ecological potential of forests as a mitigation strategy. This approach recognizes that secondary forests that have regrown on abandoned farmland generally have lower biodiversity and store 60% less carbon compared to original old-growth forests. Strategies for pro-forestation include rewilding efforts and establishing wildlife corridors.

Implementing mitigation measures in forestry can be a slow process and may involve trade-offs, particularly concerning food prices. Additionally, there can be indirect impacts on climate from changes in land use that result from these measures, known as indirect land use change spill-over effects. These complexities highlight the challenges associated with forestry-based mitigation actions.

Afforestation involves planting trees in areas where there was previously no tree cover. Scenarios envisioning new plantations spanning up to 4000 million hectares (Mha) suggest a cumulative carbon storage potential exceeding 900 GtC (2300 GtCO₂) by 2100. However, afforestation alone is not a viable substitute for aggressive emissions reduction efforts. The scale of plantations required would result in the elimination of most natural ecosystems or a reduction in food production. An example of an afforestation initiative is the Trillion Tree Campaign²².

Supporting the regrowth of existing roots and tree stumps, even in areas that have been deforested for an extended period, is argued to be more effective than tree planting. The primary obstacle hindering regrowth is the lack of legal ownership of trees by local communities.

Reforestation involves replenishing depleted forests or areas that recently had forest cover. Reforestation efforts could save at least 1 GtCO₂ per year, with an estimated cost ranging from \$5 to \$15 per ton of carbon dioxide (tCO₂). The restoration of degraded forests worldwide could result in the capture of approximately 205 GtC (750 GtCO₂). With the expansion of intensive agriculture and urbanization, abandoned farmland is increasing. Some estimates indicate that for every acre of original old-growth forest cleared, over 50 acres of new secondary forests are emerging. Promoting regrowth on abandoned farmland in certain countries could offset years of emissions.

Planting new trees can be a costly and risky endeavor. For instance, around 80% of trees planted in the Sahel region die within two years. Reforestation offers higher carbon storage potential compared to afforestation. In the case of mangroves,

²² "One trillion trees - uniting the world to save forests and climate". World Economic Forum. 22 January 2020. Retrieved 8 October 2020.



reforestation is projected to result in a 60% greater carbon uptake per hectare within 40 years. Restoring mangrove areas in estuarine and coastal wetland ecosystems could lead to a 4.3-5.1% increase in annual CO₂ uptake. Assisting native species in natural sprouting is a more cost-effective approach that enhances survival rates. Even in long-deforested areas, there exists an "underground forest" comprising living roots and tree stumps. Practices like pruning and coppicing can accelerate growth and provide a sustainable source of wood fuel, which otherwise drives deforestation. These practices, known as farmer-managed natural regeneration, have been employed for centuries. However, the main obstacle to their implementation is the state's ownership of trees, as timber rights are often sold to businesses. This leads locals to uproot seedlings due to perceived liabilities. Legal assistance for local communities and changes to property laws, as seen in Mali and Niger, have resulted in significant positive transformations²³. Scientists describe these changes as the largest environmental improvements in Africa, visible even from space in the clear distinction between Niger and the more barren land in Nigeria where the law remains unchanged.

There exist numerous measures to enhance soil carbon, making it a complex and challenging process to measure and account for. One advantage of these measures is that they involve fewer trade-offs compared to other approaches such as BECCS or afforestation (citation needed).

Globally, the protection of healthy soils and restoration of the soil carbon sponge have the potential to annually remove 7.6 billion tons of carbon dioxide from the atmosphere, surpassing the annual emissions of the United States. Trees play a crucial role in capturing CO₂ both above and below ground, contributing to the development of a soil carbon sponge. Carbon stored above ground is immediately released as CO₂ when wood is burned, while if dead wood remains undisturbed, only a portion of the carbon returns to the atmosphere during decomposition.

Methods that enhance carbon sequestration in soil include no-till farming, residue mulching, and crop rotation, with organic farming making greater use of these techniques compared to conventional farming. Given that only 5% of US farmland currently implements no-till and residue mulching, there is significant potential for carbon sequestration.

Farming practices can deplete soil carbon and degrade its ability to support life. However, conservation farming can safeguard carbon in soils and gradually restore

²³ ["Community forestry can work, but plans in the Democratic Republic of Congo show what's missing". *The Conversation*. 29 June 2020. Retrieved 2 June 2022.](#)



their health over time. The adoption of cover crops in farming represents a form of climate-smart agriculture. Scientists have identified key management practices for increasing soil organic carbon in European soils, including converting arable land to grassland, straw incorporation, reduced tillage, straw incorporation combined with reduced tillage, ley cropping systems, and cover crops.

Regenerative agriculture encompasses practices such as conservation tillage, diversity, rotation, and the use of cover crops. It emphasizes minimizing physical soil disturbance while supporting carbon sequestration in soils. Additionally, regenerative agriculture offers other benefits, such as improving soil quality and ultimately enhancing yields.

Another mitigation option involves the production of biochar and its storage in soils. Biochar is the solid material remaining after biomass pyrolysis. During biochar production, half of the carbon from the biomass is released into the atmosphere or captured using carbon capture and storage (CCS) technology, while the remaining half is retained as stable biochar. Biochar can persist in the soil for thousands of years, potentially improving the fertility of acidic soils and increasing agricultural productivity. Furthermore, the heat released during biochar production can be utilized as bioenergy²⁴.

The CEECCA countries recognize that climate change has had a significant impact on their economies and could have even greater impacts. However, the social challenges of climate change are reflected in their climate strategies extremely unsatisfactorily. It seems that governments are very concerned about the economic consequences, such as the fall (or increase) of agricultural production and the physical damage caused by floods, droughts and extreme weather events, which are usually well studied and studied. - Quantitative analysis. However, the impact on the health of the population, the level of poverty and well-being of the population, as well as on the quality of life, migration processes, the environment and other social consequences in national climate action plans are almost completely ignored. Lack of focus, benchmarks, and priority on social issues results in low efficiency, slow progress, and limited pathways for social and economic development. In this regard, more needs to be done in all CEECCA countries.

And one more thing: climate policies and strategies are often not linked to social issues, which is mainly due to poor communication between responsible authorities

²⁴ Dominic Woolf; James E. Amonette; F. Alayne Street-Perrott; Johannes Lehmann; Stephen Joseph (August 2010). "Sustainable biochar to mitigate global climate change"



and civil society groups or its absence. For example, non-governmental organizations (NGOs) involved in social and environmental issues often fail to communicate or attract funding and media attention. Rather, they should try to understand the relationship between social problems and climate change issues, and come together to achieve better outcomes and results.

Most CEECCA countries have fairly reliable primary data and hydrometeorological monitoring information, although some low-income countries lack the expertise, technical capacity and skilled workforce to provide up-to-date information and provide decision makers at the national level

analytical support. This requires international support.

Some CEECCA countries welcome the short-term benefits that climate change brings, especially in the field of agriculture, but underestimate the long-term negative consequences for the socio-economic sphere and the environment. For this reason, their development strategies do not pay attention to aspects of climate resilience and adaptation, as well as related technology and investment priorities, or addressing social challenges related to climate change today and in the future, at the national and local levels.

The requirements and standards of the EU in relation to policy measures for adaptation and strategic planning are appropriate and useful for the CEECCA states that are members of the European Union or have signed association agreements with it. Croatia, the Czech Republic and Hungary can help the governments of other CEECCA countries to develop strategies and programs to build climate resilient economies, provide funding and implement concrete adaptation measures. A number of countries have well developed prioritization procedures based on in-depth analysis and consultation with various stakeholder groups that could be shared with other countries. Similar approaches could be taken with other international associations, such as the EAEU, which would harmonize policies and measures to build resilience and adaptation.

Many CEECCA countries have already attracted international climate finance for climate programs and projects. Various UNFCCC funds, international financial institutions, and bilateral and multilateral sources plan to provide more of these resources. Private financing is possible through institutions such as the OECD FTI, the C IF Climate Resilience Pilot Program and the EBRD.



Closing and conclusion

Outdoor air pollution is one of the most serious environmental factors affecting the health of every person in low-, middle- and high-income countries.

Outdoor air (outdoor air) pollution in both urban and rural areas is estimated to be responsible for 4.2 million premature deaths globally in 2019; this mortality is due to exposure to fine particulate matter, which leads to the development of cardiovascular, respiratory and oncological diseases.

Air pollution is one of the most serious environmental threats to human health. By taking action to reduce air pollution, countries can reduce the burden of diseases such as stroke, heart disease, lung cancer, and chronic or acute respiratory diseases, including asthma.

In 2019, 99% of the world's population lived in areas where air pollution levels exceeded the values set in the WHO air quality guidelines.

The combined effects of ambient and indoor air pollution are responsible for 6.7 million premature deaths per year.

In 2019, outdoor (outdoor) air pollution is estimated to be the cause of 4.2 million premature deaths worldwide.

About 89% of these premature deaths occurred in low- or middle-income countries, mainly in the WHO regions of South-East Asia and the Western Pacific.

The impact of key sources of air pollution can be reduced through policies and investments that promote cleaner modes of transport, improve the energy efficiency of buildings, electricity and industry, and improve municipal waste management systems. In some regions, household clean energy systems will also significantly reduce ambient air pollution.

general information

Outdoor air pollution is one of the most serious environmental factors affecting the health of every person in low-, middle- and high-income countries.

Outdoor air (outdoor air) pollution in both urban and rural areas is estimated to be responsible for 4.2 million premature deaths globally in 2019; this mortality is due to exposure to fine particulate matter, which leads to the development of cardiovascular, respiratory and oncological diseases.

According to WHO estimates, in 2019, about 37% of premature deaths associated with outdoor air pollution were due to coronary heart disease and stroke, 18% and 23% due to chronic obstructive pulmonary disease and acute lower respiratory tract



infections, respectively, and 11% - as a result of oncological diseases of the respiratory tract.

People living in low- and middle-income countries bear a disproportionate burden of disease caused by outdoor air pollution: these areas account for 89% of cases (out of 4.2 million premature deaths). The greatest burden of disease is found in the WHO regions of South-East Asia and the Western Pacific. Recent estimates of the burden of disease indicate a large role for air pollution in the development of cardiovascular diseases, including fatal ones.

Policies to reduce air pollution

A key measure to protect public health is the fight against air pollution, which is the second most important risk factor for the development of non-communicable diseases.

Most sources of outdoor air pollution cannot be controlled by individuals, requiring consolidated action by local, national and regional policy makers in sectors such as energy, transport, waste management, urban planning and agriculture.

There are many examples of successful policies to reduce air pollution that are featured in this article.